## **GUJARAT TECHNOLOGICAL UNIVERSITY**

**BE - SEMESTER-III (NEW) EXAMINATION - WINTER 2017** 

Subject Code: 2130904 Date:29/11/2017

**Subject Name: DC Machines and Transformer** 

Time: 10:30 AM to 01:00 PM Total Marks: 70

**Instructions:** 

1. Attempt all questions.

1. Yd1

- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.

			MARKS
Q.1	(a) (b) (c)	Write a list of the speed control methods for DC motors. Briefly describe the short circuit test of a single phase transformer. Define voltage regulation of a transformer. Describe the method to find out voltage regulation of a transformer using open circuit and short circuit tests.	03 04 07
Q.2	(a) (b)	Derive the EMF equation of a DC generator from first principle.  Mention the conditions for satisfactory parallel operation of three phase transformers.	03 04
	(c)	A 37.3 KW, 460 V, DC shunt motor running at no load takes a current of 4 A and runs at a speed of 660 rpm. The armature resistance is 0.3 Ohm and Shunt field resistance is 270 Ohm. Find the (1) Input current and (2) Speed, when the motor is running at full load. Assume that no load input of armature circuit is equal to iron and rotational losses.  OR	07
	(c)	Two three phase transformers are operated in parallel to share a total load of 300 kVA at 0.8 lagging power factor. The pu impedances (Considering the ratings as base values) and power ratings of the transformers are given below.  Transformer A: $200 \text{ kVA}$ , $Z = 0.01 + j0.03 \text{ pu/phase}$ Transformer B: $400 \text{ kVA}$ , $Z = 0.01 + j0.03 \text{ pu/phase}$ Find out the load shared by each transformer	07
Q.3	(a)		03
	<b>(b)</b>	Write a short note on current transformer and its applications.	04
	(c)	Explain the procedure and calculations for Field test on identical DC series machines.	07
		OR	
<b>Q.3</b>	(a)	Derive the equation of pitch factor for short pitch coil.	03
	<b>(b)</b>	Draw the schematic diagrams and explain the winding connections for the short shunt and long shunt compound generators.	04
	(c)	Draw and explain the winding connections and vector diagram for Scott (T-T) connection. Derive the utilization factor for Scott connection.	07
<b>Q.4</b>	(a)	Briefly describe the role of compensating winding.	03
	<b>(b)</b>	Explain the MMF distribution of a single phase distributed winding.	04
	<b>(c)</b>	Draw the vector diagrams and winding connections for the following:	07

2. Dz0

## OR

Q.4	(a)	Briefly discuss the polarity test of a single phase transformer.	03
	<b>(b)</b>	Briefly describe the voltage build up process of a self excited DC shunt	04
		generator.	
	<b>(c)</b>	Draw the vector diagrams and winding connections for the following:	07
		1. Dy11 2. Yz1	
Q.5	(a)	Briefly explain the concept of electrical degree and mechanical degree in	03
		case of rotating machines.	
	<b>(b)</b>	Draw the circuit and explain Sumpner's test on single phase transformers.	04
	<b>(c)</b>	Draw the schematic diagram and explain the solid state speed control	07
		(Speed control using power electronic switches) of DC motors.	
		OR	
Q.5	(a)	Explain the power flow diagram of a DC machine.	03
	<b>(b)</b>	Draw and explain the internal characteristic of a DC shunt generator.	04
	(c)	Briefly explain the ON load and OFF load tap changing transformers.	07

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